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Lysozyme is a well-known protein which is used in food processing and is also an important constituent of human secretions such as sweat and saliva. It has a well-defined mass (14307 u) and can easily be detected by mass spectrometric methods such as MALDI (Matrix-assisted laser desorption ionization) in contrast to many other organic materials. Also the thermal properties, including the heat-induced decomposition behavior are comparatively well-known. For laser-irradiation at wavelengths above 310 nm, no photochemical processes occur initially, but the material is ejected via photothermal processes.

The ablation of lysozyme from a dry pressed target in vacuum was measured by weight loss for nanosecond and femtosecond laser pulses at 355 or around 532 nm with a fluence of 1 J/cm^2. A typical ablation yield for a 10-mJ pulse is about 150 micrograms/pulse, corresponding to the removal of ~ 6.3×10^{15} molecules per pulse. This is perhaps one of the highest ablation yields ever measured. Films with a significant number of intact lysozyme molecules have been produced by PLD (pulsed laser deposition) and MAPLE (Matrix-assisted pulsed laser evaporation). The deposition of intact molecules is expected in MAPLE, but is surprising in PLD, where a high degree of thermal fragmentation is typically required for generation of a sufficient amount of volatile decomposition products that drive the transfer of molecules to the film substrate. The experimental results will be discussed based on the results of molecular-level modeling. In particular, the effect of the possible presence of trapped water pockets in the lysozyme targets is investigated in the simulations and the minimum amount of water required for the lift off of the intact molecules is established.